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10/654,410

09/03/2003

John Macpherson

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EXAMINER

FITZGERALD, JOHN P

ART UNIT

PAPER NUMBER

2856

DATE MAILED: 06/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/654,410

Applicant(s)

MACPHERSON, JOHN

Examiner

John P Fitzgerald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 14, 15, 17-20, 25-30 and 34-37 is/are rejected.
- 7) ☒ Claim(s) 7-13, 16, 21-24, 31-33 and 37 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 12 January 2004.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_.

## **DETAILED ACTION**

### ***Specification Objections***

1. The disclosure is objected to because of the following informalities: On page 12, line 1 of the instant specification, "Figure 2A-1" is declared. No such Figure exists in the instant application. Appropriate correction is required.

### ***Claim Objections***

2. Claim 37 is objected to because of the following informalities: no indication of dependence of a previous claim. For the purposes of examination, it assumed claim 37 is dependent upon claim 28. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 1 is rejected under 35 U.S.C. § 102(b) as being anticipated by US 5,159,577 to Twist. Twist discloses a method of determining a resistivity parameter (MWD formation density signal) of an earth formation using a logging (MWD) tool within a borehole penetrating the earth formation (Figs. 1-4) including the steps of obtaining a plurality of first measurements with a resistivity sensor (acoustic, gamma, neutron and electromagnetic sensors) (Twist: col. 5, lines 5-

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7) indicative of the parameter of interest at a plurality of rotational positions of the logging tool (signal collected every quarter turn of revolution of the tool: Twist: col. 10, lines 46-49), the resistivity sensor having a substantially uniform azimuthal (i.e. radial direction and/or plane orthogonal to the borehole/logging tool longitudinal axis) response characteristic (Twist: col. 10, lines 25-30), that is, free from the effects of eccentricity and determining and correcting the resistivity parameter from measurement made by the resistivity sensor at a position that is not at the center of the borehole (i.e. eccentricity, the radial movement of the logging tool due to whirling or precession).

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2-6, 14 and 15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over US 5,159,577 to Twist as applied to claim 1 above, and further in view of US 5,012,412 to Helm. Twist discloses a method for determining a resistivity parameter of an earth formation having all of the elements stated previously. Twist further discloses the compensation of a MWD formation density signal obtained from sensors mounted within a drill collar, the sensors being located circumferentially and axially spaced within the drill collar; the sensors being arranged in a variety of configurations with different axial and circumferential spacings with respect to the sensor location, as well as single or multiple sensor banks; the sensors additionally employed to

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determine both the apparent rotational speed of the drill collar on which the sensors are mounted and the location of the tool within the borehole (and subsequently, the position of the sensors, i.e. the distance from a specific sensor to a borehole wall at a certain point in time and the average distance between the sensors and the borehole wall, and/or the position of the axis of the collar which houses the tool with respect to the axis of the borehole) (as recited in claim 2) (Twist: col. 4, lines 12-16 and col. 18, lines 1-6) to determine the presence of tilted formation bed boundaries, the shape of the surrounding rock/bed formations (Twist: col. 7, lines 40-47) (as recited in claim 14); the altering of the drilling conditions in response to the sensors measurements including the changing the weight-on-bit (WOB), changing the rotational rate of the drill string (RPM), or activating adjustable centralizers (Twist: col. 17, lines 5-19). Twist does not expressly disclose the employment of an orientation sensor(s) (magnetometer) indicative of a toolface angle of the logging tool at the plurality of rotational positions (as recited in claims 2-4); an additional sensor(s) (x- and y- accelerometers) making measurements indicative of the position of the logging tool relative to the center of the borehole at the plurality of rotational positions (as recited in claims 2, 5 and 6). US 5,014,412 to Helm discloses the employment of tri-axial (x- y- and z-) magnetometers and accelerometers used for determining azimuth and inclination and are dependent upon the instantaneous tool face angle when measurements are taken while the drill string is rotating (Helm: col. 1, line 12 to col. 2, line 45). It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ magnetometers and accelerometers, as taught by Helm, modifying the method of determining the resistivity parameter of an earth formation disclosed by Twist, thus providing an

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accurate determination of the tool face (azimuth) angle of a borehole while a drill string is being rotated.

7. Claims 17-20, 24-30 and 34-37 are rejected under 35 U.S.C. § 103(a) as being unpatentable over US 5,159,577 to Twist and US 5,012,412 to Helm. Twist discloses a measurement-while-drilling (MWD) tool (note: equivalent of a bottom-hole-assembly (BHA) or system) determining a resistivity parameter of an earth formation (Figs. 1-4) including a resistivity sensor for making a plurality of first measurements with a resistivity sensor (acoustic, gamma, neutron and electromagnetic sensors) (Twist: col. 5, lines 5-7) indicative of the parameter of interest at a plurality of rotational positions of the MWD tool (BHA/system) (signal collected every quarter turn of revolution of the tool: Twist: col. 10, lines 46-49); the compensation (i.e. a processor processing the measured resistivity parameter signal based on the position of MWD tool (BHA/system) via Fast Fourier Transforms (FFT) obtained from sensors mounted within a drill collar) (as recited in claims 25 and 34), the sensors being located circumferentially and axially spaced within the drill collar; the sensors being arranged in a variety of configurations with different axial and circumferential spacings with respect to the sensor location, as well as single or multiple sensor banks; the sensors additionally employed to determine both the apparent rotational speed of the drill collar on which the sensors are mounted and the location (i.e. offset) of the tool within the borehole (and subsequently, the position of the sensors, i.e. the distance from a specific sensor to a borehole wall at a certain point in time and the average distance between the sensors and the borehole wall (i.e. standoff), and/or the position of the axis of the collar which houses the tool with respect to the axis of the borehole) (as recited in claims 17, 24 and 28) (Twist: col. 4, lines 12-16 and col. 18, lines 1-6) to determine the

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presence of tilted formation bed boundaries, the shape of the surrounding rock/bed formations (Twist: col. 7, lines 40-47) (as recited in claim 25-27 and 35); the altering of the drilling conditions in response to the sensors measurements including the changing the weight-on-bit (WOB), changing the rotational rate of the drill string (RPM) and bit (as recited in claims 36 and 37), or activating adjustable centralizers (Twist: col. 17, lines 5-19). Twist does not expressly disclose the employment of an orientation sensor(s) (magnetometer) indicative of a toolface angle of the logging tool at the plurality of rotational positions (as recited in claims 2-4); an additional sensor(s) (x- and y- accelerometers) making measurements indicative of the position of the MWD tool (BHA/system) relative to the center of the borehole at the plurality of rotational positions (as recited in claims 17, 18, 20 and 28-30). US 5,014,412 to Helm discloses the employment of tri-axial (x- y- and z-) magnetometers and accelerometers used for determining azimuth and inclination and are dependent upon the MWD tool (BHA/system) when measurements are taken while the drill string is rotating (Helm: col. 1, line 12 to col. 2, line 45). It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ magnetometers and accelerometers, as taught by Helm, modifying the method of determining the resistivity parameter of an earth formation disclosed by Twist, thus providing an accurate determination of MWD tool (BHA/system) (azimuth) angle of a borehole while a drill string is being rotated. Lastly, in specific regards to claim 28, the mounting of a processor either above ground in direct communication with the sensors on the MWD tool (BHA/system), or downhole mounted on the MWD tool (BHA/system) is considered old and well known and well with the purview of one of ordinary skill in the art based on design choice considerations.

***Allowable Subject Matter***

8. Claims 7-13, 16, 21-24 and 31-33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Coles, Holenka et al., Brooks, Dowell et al., Hagiwara et al., Edwards et al., Kurkoski, Haugland, Li, Fanini et al., Orban et al., Jerabak et al. and Deboaisne et al. all disclose various aspects and details of the instant invention, including MWD tools (BHA/systems) utilizing sensors for measuring resistivity parameters within formations.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Fitzgerald whose telephone number is (571) 272-2843. The examiner can normally be reached on Monday-Friday from 7:00 AM to 3:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams, can be reached on (571) 272-2208. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you




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have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



JF

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